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NATIONAL DAM SAFETY PROGRAM. WHITES LAKE DAM (MO 40034), LOWER --ETC(U)
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.	

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

WHITE'S LAKE DAM
STODDARD COUNTY, MISSOURI

MISSOURI INVENTORY NO. 40034

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: ST. LOUIS DISTRICT CORPS OF ENGINEERS
FOR: GOVERNOR OF MISSOURI

MARCH 1980

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

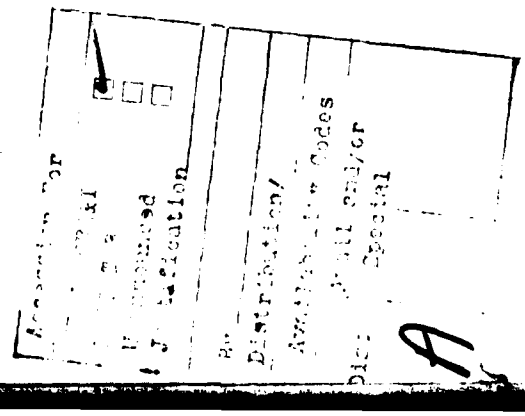
Name of Dam	White's Lake Dam
State Located	Missouri
County Located	Stoddard County
Stream	Link Creek
Date of Inspection	18 May 1979

The White's Lake Dam was inspected by an interdisciplinary team of engineers from the Memphis District, U. S. Army Corps of Engineers. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and state agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. Failure would threaten the life and property of five families downstream of the dam and cause appreciable damage to Highway 25 bridge located approximately .6 mile downstream.

The inspection and evaluation indicate that the spillway does not meet the criteria set forth in the guidelines for a dam having the above mentioned size classification and hazard potential. For its size and hazard category, this dam is required by the guidelines to pass from one-half PMF to PMF. However, considering the high-hazard potential to life and property of approximately five families downstream of the dam, the PMF is considered the appropriate spillway design flood. The emergency spillway will only pass 40 percent of the PMF before the dam embankment is overtopped. Because the spillway will not pass one-half of the PMF without overtopping but will pass the 10-year frequency flood, the dam is classified as "unsafe non-emergency". The spillway will pass the 100-year flood without overtopping, which is a flood that has a 1 percent chance of being exceeded in any given year. There are no other hydrologic or hydraulic deficiencies.

Other deficiencies visually observed by the inspection team were wave wash along the upstream face of dam; willows and small brush growing along the upstream face and downstream slope; erosion gullies along the downstream slope; and seepage which extends from near the right abutment to the outlet along the downstream toe. Another deficiency found was the lack of seepage and stability analysis records.



It is recommended that the owner take action to correct or control the deficiencies described. Corrective works should be in accordance with analyses and design performed by an engineer experienced in the design and construction of dams.

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14 APR 1980
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Overview of Lake

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WHITE'S LAKE DAM - ID NO. 40034

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1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the District Engineer for the St. Louis District, Corps of Engineers, directed that a safety inspection of White's Lake Dam be made.

b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earthen embankment built between two gently rolling hills in the uplands which border the Mississippi Embayment. Topography adjacent to the valley is gently rolling. Soils in the area are formed of silty clay. Topography in the vicinity of the dam is shown on Plate 2.

(2) A canopy inlet structure constructed of 8 inch diameter steel pipe that runs on a slope of 1V on 5.7H through the embankment for a horizontal distance of 122 feet is the primary means of discharge. An emergency spillway is cut in the left abutment. The emergency spillway is approximately trapezoidal with an average bottom width of 50 and side slopes of approximately of 1V on 25H.

(3) Pertinent physical data are given in paragraph 1.3 below.

b. Location. The dam is located in the central portion of Stoddard County, Missouri, as shown on Plate 1. The lake formed by the dam as shown on Plate 2 is located on the Bloomfield, Missouri Quadrangle sheet in Section 1; Township 26 North; Range 10 East.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1 c above. Based on these criteria, this dam is in the small size category.

d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph c above. Based on referenced guidelines, this dam is in a High Hazard Classification.

e. Ownership. The dam is owned by Mr. Ed. Eubanks, Eubanks Trucking Co., Hwy 25 N, Dexter, Mo. 63841. The previous owner was Mr. Ray White whose address is unknown.

f. Purpose of Dam. The dam forms a 9-acre recreational lake.

g. Design and Construction History. The dam was constructed in 1971 by the previous owner, Mr. Ed. White. The contractor who performed the construction was not determined. The type of equipment and the location of the borrow area could not be determined. The dam was reportedly designed by the Soil Conservation Service, United States Department of Agriculture, but no design plans were available. A core trench was reported as part of the design with a 10 foot bottom width with side slopes of 1V on 1H and a minimum depth of 4 feet. It was also reported that the upstream slope was designed on 1V to 3H slope and the downstream slope was designed on 1V to 2H slope.

h. Normal Operating Procedure. Normal rainfall, runoff, transpiration, and evaporation all combine with unregulated discharges to maintain a relatively stable water surface.

1.3 PERTINENT DATA

a. Drainage Area - 95 acres (Topographic Quadrangle)

b. Discharge at Damsite.

(1) Discharge can take place through a canopy pipe inlet sloped through the embankment and an emergency spillway.

(2) Estimated experienced maximum flood at damsite - unknown.

c. Elevation (Feet above N.G.V.D.)

(1) Observed Pool - 420.9
(2) Normal Pool - 420.8
(3) Spillway Crest - 422.6
(4) Maximum Experienced Pool - Unknown
(5) Top of Dam - 425.0
(6) Maximum Pool (PMF) - 425.8
(7) Invert of Discharge Pipe at Stilling Basin - 399.4
(8) Streambed at centerline of dam - 398.3
(9) Maximum Tailwater - Unknown

d. Reservoir. Length of maximum pool - 1200 $\pm$ feet.

e. Storage. (Acre - feet)

(1) Observed Pool - 59
(2) Normal Pool - 58
(3) Spillway Crest - 76
(4) Maximum Experienced Pool - Unknown
(5) Top of Dam - 104
(6) Maximum Pool (PMF) - 115

f. Reservoir Surface Area (Acre)

(1) Observed Pool - 9.07
(2) Normal Pool - 8.97
(3) Spillway Crest - 10.77
(4) Maximum Experienced Pool - Unknown
(5) Top of Dam - 13.17
(6) Maximum Pool (PMF) - 13.97

g. Dam

(1) Type - earth embankment
(2) Length - 850 ± feet
(3) Height - 27.7 feet maximum
(4) Top width - 14 ± feet
(5) Side slopes
(a) Downstream - 1V on 2.63H
(b) Upstream - 1V on 3.82H
(6) Upstream Berm - el. 423 ± feet N.G.V.D. and 8 feet wide
(7) Impervious Core - (Reported as); bottom width -10 feet
depth - 4 feet
side slopes - 1V on 1H
(8) Cutoff - unknown
(9) Grout curtain - unknown

h. Diversion and Regulating Tunnel. None.

i. Primary Discharge System.

(1) Type - An uncontrolled 8 inch diameter steel pipe canopy inlet type sloping through the embankment (see paragraph 1.2 a).
(2) Horizontal length of 8-inch diameter pipe -122 feet
(3) Inlet invert elevation of discharge pipe - 420.8 N.G.V.D.
(4) Invert of discharge pipe at stilling basin - 399.4 N.G.V.D.

j. Emergency Spillway

(1) Type - Uncontrolled earthen
(2) Width of weir - 50 feet (bottom width)
(3) Length of weir - N/A
(4) Crest elevation - 422.6 N.G.V.D.
(5) Side Slopes - 1V on 25H

k. Regulating Outlet. None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The dam was reportedly designed by the Soil Conservation Service of the United States Department of Agriculture. However no design data were available for review. Some values of surface area and volume were found in the SCS office at Bloomfield, Mo. Whether or not slope stability and seepage analyses were performed using suitable loading conditions including earthquake forces is unknown.

2.2 CONSTRUCTION

The dam was constructed in 1971 by the previous owner, Mr. Ed. White. The contractor who performed the construction was not determined. The type of equipment, method of construction, and location of borrow area could not be determined. It was reported that the upstream slope and downstream slopes were designed on slopes of 1V on 3H and 1V on 2H, respectively. Based on the inspection survey, the existing upstream and downstream slopes are 1V on 3.82H and 1V on 2.63H, respectively. Also noted by the inspection team was a small upstream berm whose width is approximately 8 feet at a mean elevation of 423 N.G.V.D. A 10 feet wide core trench with side slopes of 1V on 1H at a depth of 4 feet was also reported. The primary means of discharge is an 8 inch diameter steel pipe sloping through the embankment on a slope of 1V to 5.7H for a horizontal distance of 122 feet. An emergency spillway is cut in the left abutment. The emergency spillway has an average bottom width of 50 feet and side slopes of 1V to 25H. The crest elevation is 422.6 N.G.V.D.

2.3 OPERATION

Normal rainfall, runoff, transpiration, and evaporation together with the uncontrolled discharge structure combine to maintain a relatively stable water surface elevation. No record was available to ascertain if any overtopping has occurred in the past.

2.4 EVALUATION

a. Availability. The only engineering data readily available was the personal recollection of USDA Soil Conservation personnel and the results of the inspection field survey.

b. Adequacy. The field and visual inspections presented herein are considered adequate to support the conclusion of the report. There was no design data available to evaluate the adequacy of the hydrologic or hydraulic design. The surface areas and volumes obtained from the SCS records were compatible with the values used in this report. Also, seepage and stability analyses comparable to the requirements of the "Recommended Guideline for Safety Inspection of Dams" were not available which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.

c. Validity. Not applicable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. Visual inspection of White's Lake Dam was performed on 18 May 1979. Personnel making the inspection were employees of the Memphis District, Corps of Engineers, and included a geologist, hydraulic engineer, and soils engineer. Specific observations are discussed below.

b. Dam. No detrimental settlement, cracking, or slides were observed in or near the earth embankment (see Photo 1). A typical existing cross-section of the embankment is shown on Plate 4. A dam plan view is shown on Plate 3. The existing upstream slope is 1V on 3.82H, and the existing downstream slope is IV on 2.63H. The crest width was measured to be approximately 14 feet.

The upstream slope is well covered with grass, fescue, and lespedeza. Small willows are growing along the water's edge (see Photo 2 and 8). Wavewash occurs on the upstream face with the worst area near the right abutment (see Photo 3). A small berm exists on the upstream slope with an approximate width of 8 feet and a mean elevation of 423 N.G.V.D. (see Plate 4). The crest of the dam is well maintained (see Photo 1). The downstream slope is well maintained and has good grass protection (see Photos 4, 5, and 6). Slight erosion occurs on the downstream face but appears to be controlled with good grass cover (see Photo 7). Seepage was observed along the downstream toe from an area near the right abutment to the outlet (see photos 9 and 10). No estimate of the seepage flow rate could be determined. None of the seepage appeared to be piping any material from the embankment or foundation. The marshy area and seepage extends from Station 4+10 to Station 6 + 37 along the toe of the dam. A second seepage area was noted on the downstream toe at Station 8 + 29 approximately 34 feet downstream from the centerline of the dam. Also, an erosion gully was observed along the downstream toe as a result of releases from the emergency spillway. The gully is approximately 1½ feet wide and 1 foot deep. However, the erosion is not affecting the integrity of the foundation or embankment.

c. Appurtenant Structure. A canopy inlet structure constructed of 8 inch diameter steel pipe that runs on a slope of 1V on 5.7H through the embankment for a horizontal distance of 122 feet is the primary means of discharge (see Photo 11). The inlet invert elevation is 420.8 N.G.V.D. No trash rack was observed. The outlet invert elevation is 399.4 N.G.V.D. The outlet discharges into a stilling basin whose approximate dimensions are 15' x 10' and which is approximately 5 feet deep (see Photo 12). The inlet and discharge pipe appear to be in relatively good condition. The stilling basin appears to be stable.

An earthen emergency spillway is cut in the left abutment. The spillway is approximately trapezoidal in section with an average bottom width of 50 feet. The side slopes of the spillway are 1V on 25H and the spillway crest has an elevation of 422.6 N.G.V.D. The emergency spillway appears to be in relatively good condition with no excessive erosion occurring within the structure (see Photo 13).

d. Reservoir Area. Minor wavewash was observed on the north end of the lake. No excessive erosion or slides were observed along the shore of the reservoir.

e. Downstream Channel. Some trees and brush were observed in the downstream channel.

3.2 EVALUATION

None of the conditions observed are significant enough to indicate a need for immediate remedial action or a serious potential of failure. Visually observed seepage, willows on the upstream face, the erosion gulley running to the downstream toe from the emergency spillway, and the wavewash are deficiencies which, left uncontrolled or uncorrected could lead to the development of potential problems.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The primary discharge system and emergency spillway are uncontrolled; therefore no regulating procedures exist for those structures. The pool level is controlled by rainfall, runoff, evaporation, and the capacity of the uncontrolled discharge structures.

4.2 MAINTENANCE OF DAM

The upstream and downstream slope and crest appear to be well maintained - except for the deficiencies discussed in para 3.1 b.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist. The uncontrolled discharge structure provides the only means of discharge from the lake.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

The inspection team is not aware of any existing warning system for this dam.

4.5 EVALUATION

If the trees and brush on the upstream slope, the wavewash on the upstream embankment, and the erosion gullies on the downstream slope are allowed to continue, potential problems could develop.

SECTION 5 - HYDRAULIC /HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. No hydraulic and hydrological design was available for assessment.

b. Experience Data. The drainage area was developed using the USGS Bloomfield Quadrangle. The spillway and dam layout are made from surveys conducted by the inspecting team.

c. Visual Observation.

(1) The canopy inlet pipe structure and emergency spillway are in good condition.

(2) The pipe is located at Station 6+37 and the emergency spillway is located in the left abutment.

d. Overtopping Potential. The spillway will safely pass 40 percent of the Probable Maximum Flood (PMF) at a discharge of 390 cfs without overtopping. The Probable Maximum Flood is defined as the flood discharge that may be discharged from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The PMF will overtop the embankment for a period of 2 hrs at a depth of 0.8 feet with a discharge of 1200 cfs. The one-half PMF will also overtop the embankment for a period of 1 hr at a depth of 0.2 ft with a discharge of 520 cfs. The 100-year frequency flood will not overtop the embankment. For its size and hazard category, this dam is required by the guidelines to pass from one-half PMF to PMF. However, considering the high-hazard potential to life and property of approximately five families downstream of the dam, the PMF is considered the appropriate spillway design flood. Because the spillway will not pass one-half PMF without overtopping but will pass the 10-year frequency flood, the dam is classified as "unsafe non-emergency." The data utilized in the preparation of the estimates was various Federal reports, data from field inspection and survey, and output from COE program HEC-1, Dam Safety Version. More specific details will be found in Appendix A.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation. Visual observations of the dam and appurtenant structures are discussed and evaluated in SECTIONS 3 and 5.

b. Design and Construction Data. The design and construction data were limited to that information discussed in SECTION 2.

c. Operation Records. There have been no known operations which have affected the structural stability of the dam.

d. Post Construction Changes. No post construction changes exist.

e. Seismic Stability. The dam is located on the dividing line between Seismic Risk Zones 2 and 3. Because of its location in these Seismic Risk Zones coupled with the seepage at the dam toe and a sandy foundation, there is a possibility of liquefaction of the foundation material which could cause failure of the dam during an earthquake.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. Several items were noted during the visual inspection which should be corrected or controlled. These items are trees and brush on the upstream embankment face; wavewash on the upstream slope of the embankment; erosion gullies and wash areas on the downstream slope of the embankment; and observed seepage. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record. Also these analyses should be utilized to detail the corrective actions called for in paragraph 7.2 The Probable Maximum Flood (the spillway design flood) and one-half of the Probable Maximum Flood will both overtop the dam. Because the spillway will not pass one-half of the PMF without overtopping the dam, but will pass the 10-year frequency flood, the dam is classified as "unsafe non-emergency."

b. Adequacy of Information. Due to the lack of engineering design and construction data, the conclusions in this report were based on performance history and external visual conditions. The inspection team considers that these data are sufficient to support the conclusions herein. However, seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available which is considered a deficiency.

c. Urgency. The remedial measures recommended in paragraph 7.2 should be accomplished in the near future. The item recommended in para 7.2a should be pursued on a high-priority basis. The stability and seepage analyses should be given priority by the owner and accomplished without delay in order to determine if corrective measures are necessary. If the safety deficiencies listed in paragraph 7.1 a. are not corrected in a timely manner, they could lead to the development of potential problems.

d. Necessity for Phase II. Based on the results of the Phase I inspection, no Phase II inspection is recommended.

e. Seismic Stability. This dam is located on the boundary between Seismic Zones 2 and 3. Because of its location it is possible that an earthquake could occur of sufficient intensity to cause severe damage or failure of the dam.

7.2 REMEDIAL MEASURES

a. Alternatives. The spillway size and/or height of the dam should be increased to pass the Probable Maximum Flood without overtopping the dam.

b. Perform seepage and stability analyses to assess the safety concerns raised by the seepage present at the downstream toe of the dam. Use the results of these analyses to appropriate corrective measures.

c. O & M Maintenance and Procedures. The following O & M maintenance and procedures are recommended:

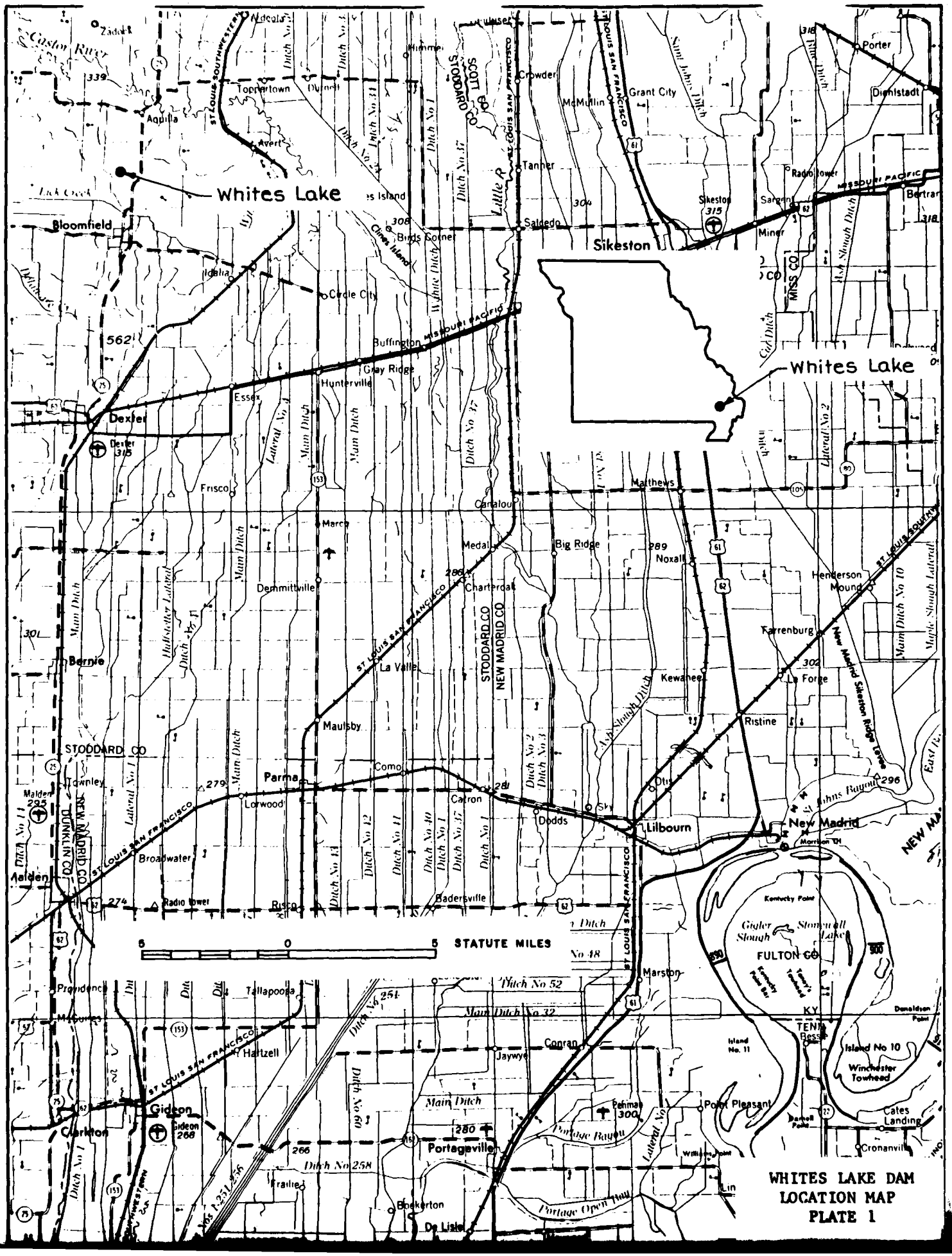
(1) Remove trees and brush on upstream embankment slope. Care should be taken during removal not to destroy the existing conditions of the upstream embankment and spillway area.

(2) Repair wave wash on upstream embankment slope and provide some type of erosion protection to prevent future occurrences.

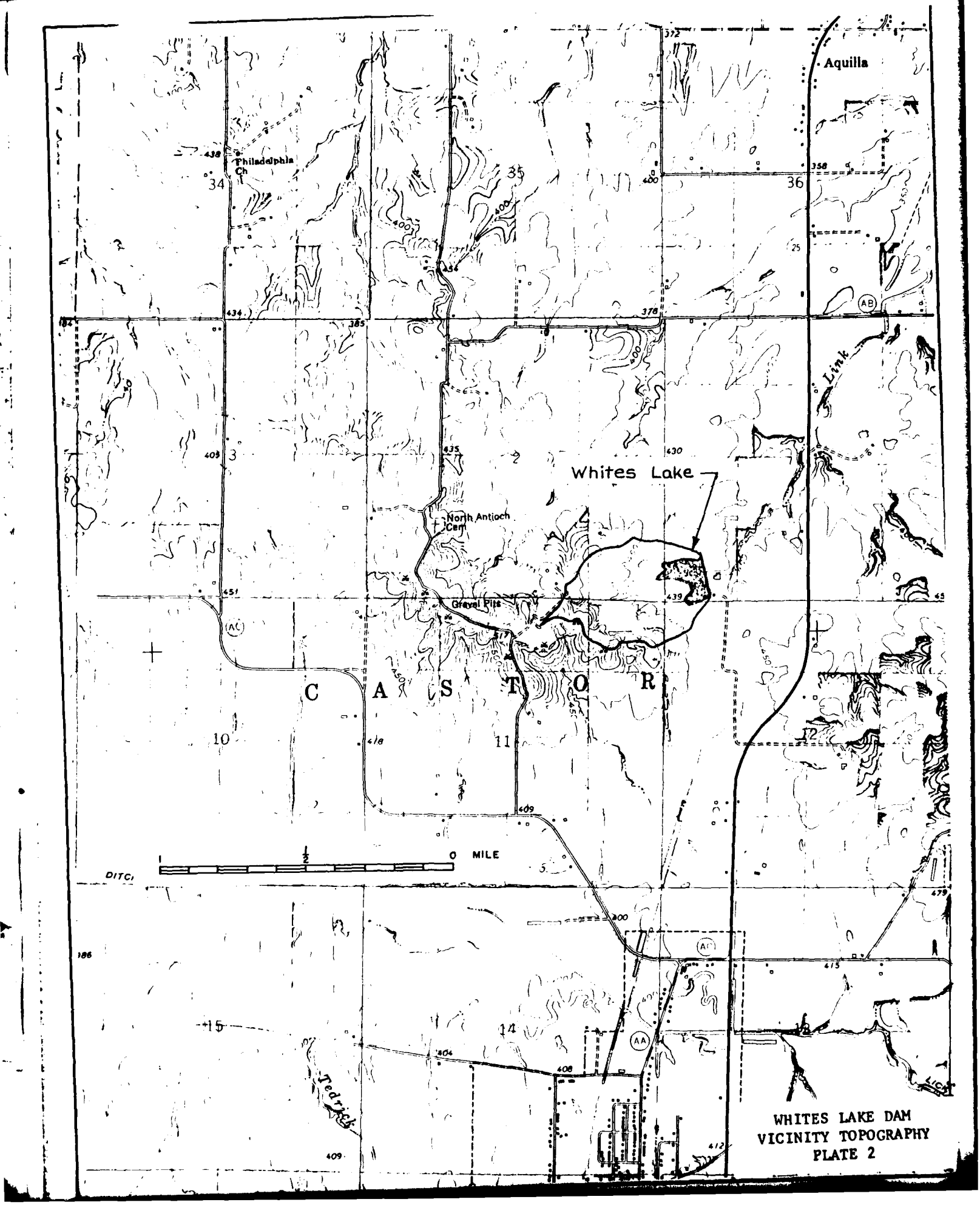
(3) Repair the downstream slope where gullies and wash areas have formed.

(4) The downstream slope and toe should be closely monitored for seepage and erosion. If seepage quantities and/or erosion observed during monitoring indicate increases or signs of material being piped from the embankment, immediate action should be taken to rectify these conditions.

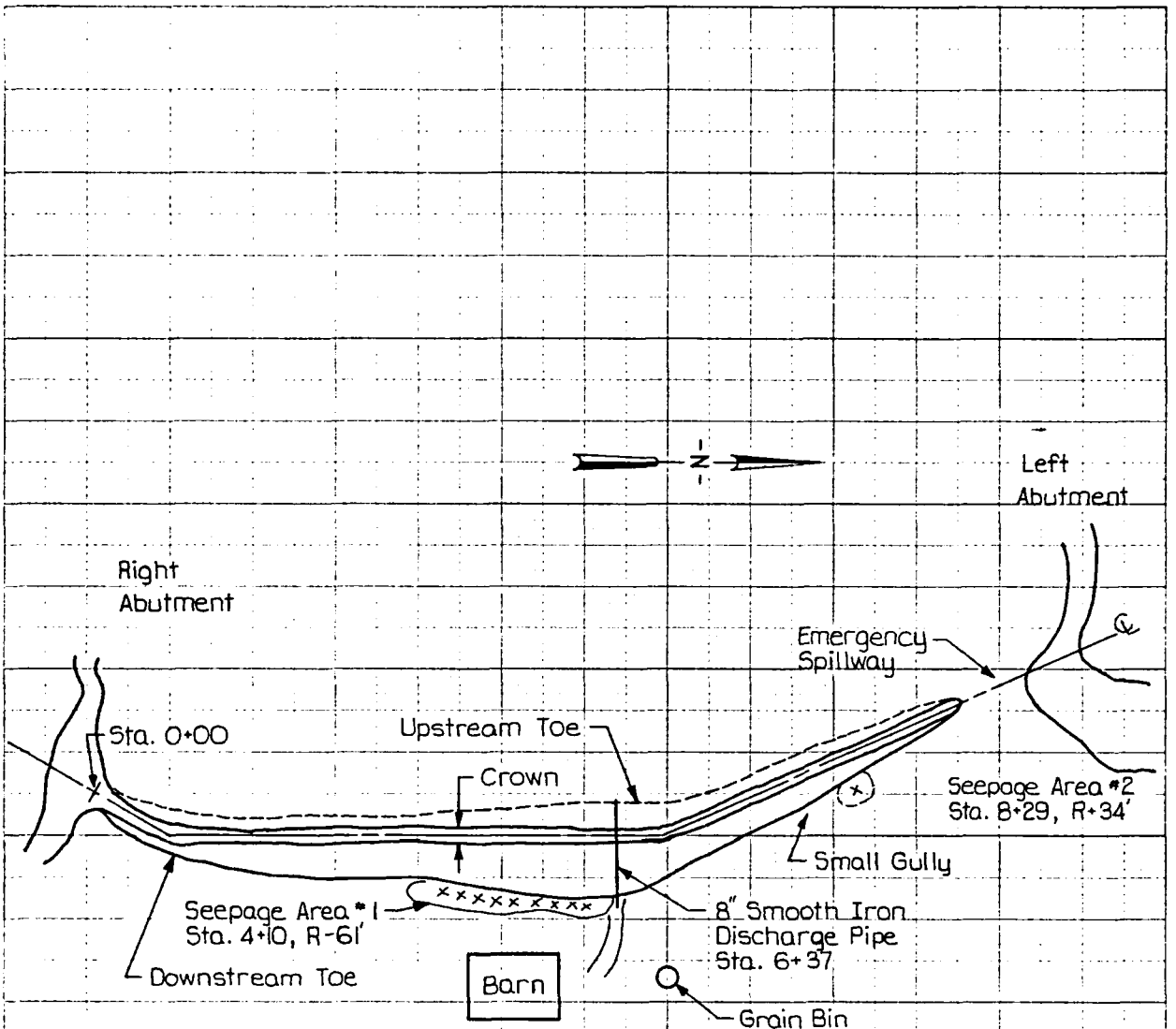
(5) A detailed inspection of the dam should be made periodically by an engineer experienced in design and construction of dams.



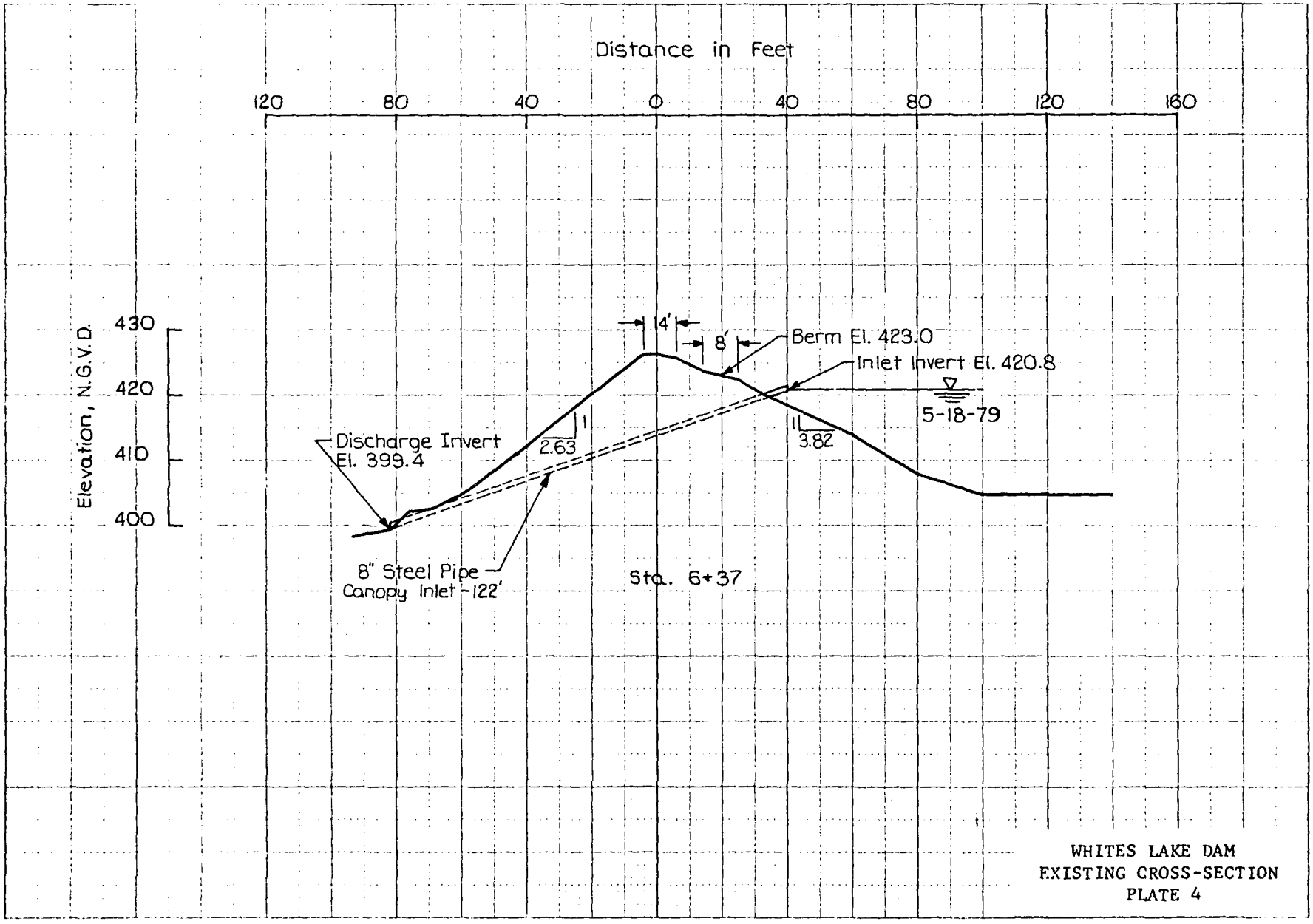
WHITES LAKE DAM
LOCATION MAP
PLATE 1



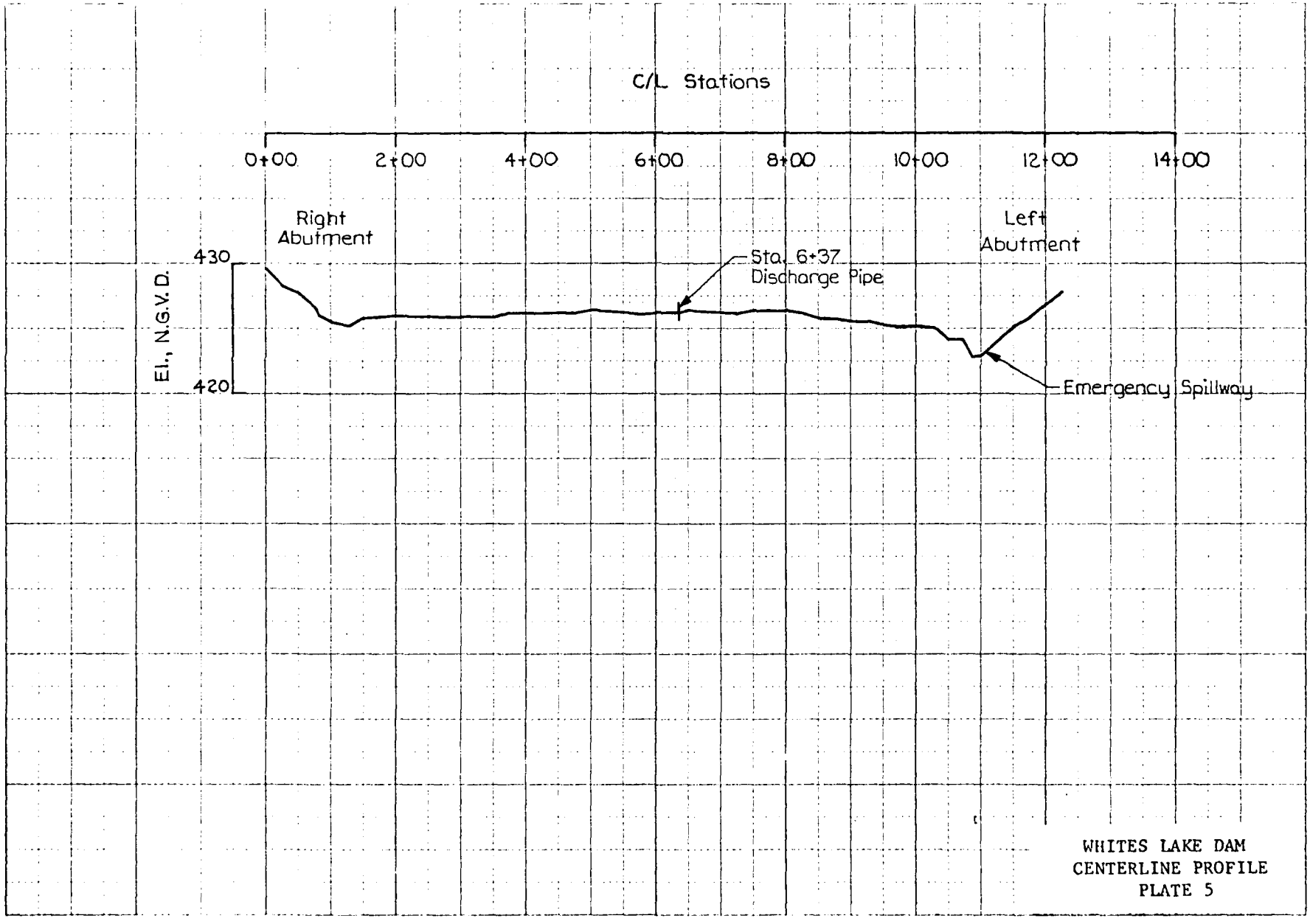
WHITES LAKE DAM
VICINITY TOPOGRAPHY
PLATE 2



WHITES LAKE DAM
DAM PLAN VIEW-NTS
PLATE 3



WHITES LAKE DAM
EXISTING CROSS-SECTION
PLATE 4



WHITES LAKE DAM
CENTERLINE PROFILE
PLATE 5

APPENDIX A

Hydrology and Hydraulics

1. Narrative. The methods and sources of data were primarily those suggested by the Hydraulics Branch, St. Louis District, Corps of Engineers. Specific references and methods will be discussed below. A field inspection survey was made to determine the outlet structures and the topographic characteristics of the dam. HEC-1, Dam Safety Version was used in conjunction with appropriate input parameters to compute inflow hydrographs, determine storage, and route through the structure.

a. Rainfall. The PMF was developed using Hydrometeorological Report No. 33. The "Hop Brook" reduction factor was not used to adjust the rainfall for this study. The distribution of rainfall was developed using the criteria as described by EM 1110-2-1411 (Standard Project Storm).

PMF Rainfall	27.2 inches
PMF Percentages	6 hr - 102
	12 hr - 120
	24 hr - 130

b. Unit Hydrograph Coefficients. The unit hydrograph for the drainage basin was developed using the Snyder Method as outlined in HEC-1, Dam Safety Version. Two methods of determining time of concentration were used, namely the Snyder's method and Kirpich method for comparative purposes.

The variables used for the appropriate method are listed below.

Snyder's:

$t_p = C_t (L L_{ca})^{0.3}$; L and L_{ca} in miles

L = 3500 feet = 0.66 miles

L_{ca} = 1600 feet - 0.30 miles

Stream Slope = 164 ft/mi. = .031 ft/ft

C_t = .56

t_p = .35 hr

t_c = .43 hr

Kirpich: $t_c = .00013 \left(\frac{(L,ft)}{\sqrt{slope, ft/ft}}\right)^{.77}$

t_c = .27 hr

Where

L = length of the main stream channel from the outlet to the divide.

L_{ca} = length along the main channel to a point opposite the watershed centroid.

C_t = coefficient used in Snyder's method.

t_p = time to peak (hr)

t_c = time of concentration (hr)

Consequently, since the time of concentrations closely agreed, a value for t_p was chosen to be .35 hr or 21 minutes which necessitated developing a 5-minute unit hydrograph and applying a 24 hr rainfall to develop the inflow hydrographs.

The general soils map of Stoddard County indicates that White's Lake Dam lies in an area where the soil is of the Loring-Memphis Association which is well and moderately well drained medium texture soils on the sloping uplands of Crowley's Ridge. This places the area in a Soil Group B/C. The primary soil cover consists of woods and pasture in a good hydrologic condition. Consequently a value of C_p = .655 was chosen as the runoff parameter to be used in Snyder's method.

Listed below are the remaining parameters necessary to develop the unit hydrograph of 5-minute duration.

$C_p = .655$

Drainage Area = .148 sq. mi.

The unit hydrograph ordinates are found in the computer printout.

c. Loss Rates. A loss rate of .5 in. initially and .05 in./hr. was chosen based upon engineering experience.

d. Base Flow and Antecedent Flood Conditions. A base flow of 1 cfs was selected and the routing was started at the low point in the spillway crest of 422.6 N.G.V.D.

e. Hydrograph Routing. HEC-1, Dam Safety Version uses the single routing step of the "Modified Puls' method. Routing through the emergency spillway and over the embankment was accomplished using the non-level dam top option of the HEC-1, Dam Safety Version (see Plate 3) coupled with critical energy consideration of the flow. The routing through the canopy inlet structure was obtained considering pipe full conditions with the following assumptions:

Horizontal Pile

D = 8 inch steel

L = 122 feet

n = .016

head losses: $h_{ent} = \frac{1}{2} \frac{V^2}{2g}$

$h_{exit} = \frac{V^2}{2g}$

h_f = friction loss in 8 inch pipe

$Q = .2958\ A_8 \sqrt{2g}\ H^{1/2}$

The invert elevation from which to calculate H, height of head, is 399.75 N.G.V.D.

f. Storage. The storage was calculated with the HEC-1, Dam Safety Version with input consisting of elevations and respective surface area which were determined using the USGS Bloomfield Quadrangle.

```
HEC-1 VERSION      JULY 1978
 LAST MODIFICATION  26 FEB 79
**********************************
  1   A
  2   A                                NON-FEDERAL DAM INSP   ION
  3   A                                      DAM =40034
  4   A                                      WHITES DAM
  5   R     300       0       5      -0      -0      -0      -0      -0      -0      -0
  6   1       5
  7   J       1       9       1
  8   I      .1      .15      .2      .25      .3      .35      .4      .5      1.
  9   K       0       1                                                1
 10   I                                PROBABLE MAXUMUM PRECIPITATION-24 HR DURATION
 11   P       1       1    .1484              .1484      1.
 12   P               27.2     102      120     130
 13   T                                                        .5      .05
 14   N      .35     .655
 15   X       1       1       2
 16   K       1       2                                        1
 17   K1                                ROUTED FLOWS THROUGH WHITES DAM
 18   Y                                        1       1
 19   Y1      1                                                -422.6
 20   KA      0   1.817   8.175  18.166
 21   KE    400     410     420     430
 22   KK  422.6                                399.75   .2958   .3491      .5
 23   KO    425
 24   KL      0      58      78     125     200     210     475    1100    1195
 25   KV  422.6   424.2   424.4   425.0   425.0   425.3   426.0   426.0   427.9
 26   K      99
```

DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
******* **********

RUN DATE: 02 JUL 79
TIME: 12.04.28

NON-FEDERAL DAM INSPECTION
DAM =40034
WHITES DAM

JOB SPECIFICATION

NQ	NMH	HMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	5	=0	=0	=0	=0	=0	=0	=0

JOPER	NRT	LROPT	TRACE
5	=0	=0	=0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS= .10 .15 .20 .25 .30 .35 .40 .50 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

PROBABLE MAXIMUM PRECIPITATION-24 HR DURATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	=0	=0	=0	=0	1	=0	=0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.15	=0.	.15	1.00	=0.	=0	=0	=0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
=0.	27.20	102.00	120.00	130.00	=0.	=0.	=0.

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
=0	=0.	=0.	1.00	=0.	=0.	1.00	.50	.05	=0.	=0.

UNIT HYDROGRAPH DATA
TP= .35 CP= .66 NTA= =0

RECESSION DATA
STRTQ= 1.00 QRCSN= 1.00 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.12 AND R= 3.37 INTERVALS

UNIT HYDROGRAPH 21 END-OF-PERIOD ORDINATES, LAG= .35 HOURS, CP= .66 VOL= 1.00

18.	65.	122.	166.	179.	154.	115.	85.	63.	47.
35.	26.	19.	14.	11.	8.	6.	4.	3.	2.
2.									

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTI- PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 .10	RATIO 2 .15	RATIO 3 .20	RATIO 4 .25	RATIO 5 .30	RATIO 6 .35	RATIO 7 .40	RATIO 8 .50	RATIO 9 1.00
HYDROGRAPH AT	1	.15	1	136.	203.	271.	339.	407.	474.	542.	678.	1355.
		(.38)		(3.84)(	5.76)(	7.67)(	9.59)(	11.51)(	13.43)(	15.35)(	19.19)(	38.37)
ROUTED TO	2	.15	1	50.	100.	152.	209.	268.	330.	392.	523.	1225.
		(.38)		(1.40)(	2.83)(	4.31)(	5.91)(	7.58)(	9.34)(	11.10)(	14.82)(	34.70)

SUMMARY OF DAM ETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	422.60	422.60	425.00
STORAGE	76.	76.	104.
OUTFLOW	4.	4.	428.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	423.64	0.	88.	50.	0.	16.58	0.
.15	424.00	0.	92.	100.	0.	16.42	0.
.20	424.26	0.	95.	152.	0.	16.33	0.
.25	424.47	0.	97.	209.	0.	16.25	0.
.30	424.64	0.	99.	268.	0.	16.25	0.
.35	424.80	0.	101.	330.	0.	16.17	0.
.40	424.93	0.	103.	392.	0.	16.17	0.
.50	425.15	.15	106.	523.	.50	16.08	0.
1.00	425.81	.81	115.	1225.	1.58	16.00	0.

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

1 A NON-FEDERAL DAM INSPECTION
2 A DAM #40038
3 A WHITES DAM

APPENDIX B
GEOLOGY OF DAM SITE

General Geology. The following geologic information was obtained from a search of the very limited available literature and one field inspection of the site.

Regional structure of the area is controlled by the Mississippi Embayment, a southerly plunging syncline whose axis is basically outlined by the course of the Mississippi River. The regional dip of the beds is about 1 to 2 degrees toward the Mississippi Embayment. Two major joint systems are present in the area. One system runs northwest to southeast and a second northeast to southwest with vertical fractures. A minor joint system exists in the North-South and East-West directions. The topography and stream patterns of the area are greatly influenced by these joints. Solutions zones were found to exist along joints and bedding planes.

Site Description. White's Lake Dam is situated between two gently rolling hills with a maximum relief of about 40 feet. The valley drainage served as a tributary for Lick Creek prior to dam construction. The embankment, abutments and foundation material are predominantly the same material, a sandy silt and clay material of the Wilcox Group. The hills above the dam are capped with a deposit of loess and underlain with undifferentiated Pleistocene terrace deposits of sand and gravel.

Seepage was observed along the downstream toe of the dam and this problem will be addressed in another section of this report. No other hazardous features such as soft seams, expansive clays or other geologic irregularities were noted. However, the dam is located on the dividing line between Seismic Risk Zones 2 and 3. Because of its location in the Seismic Risk Zone coupled with the seepage of the dam toe and a sandy foundation, there is a possibility of liquefaction of the foundation material with failure of the dam during an earthquake.

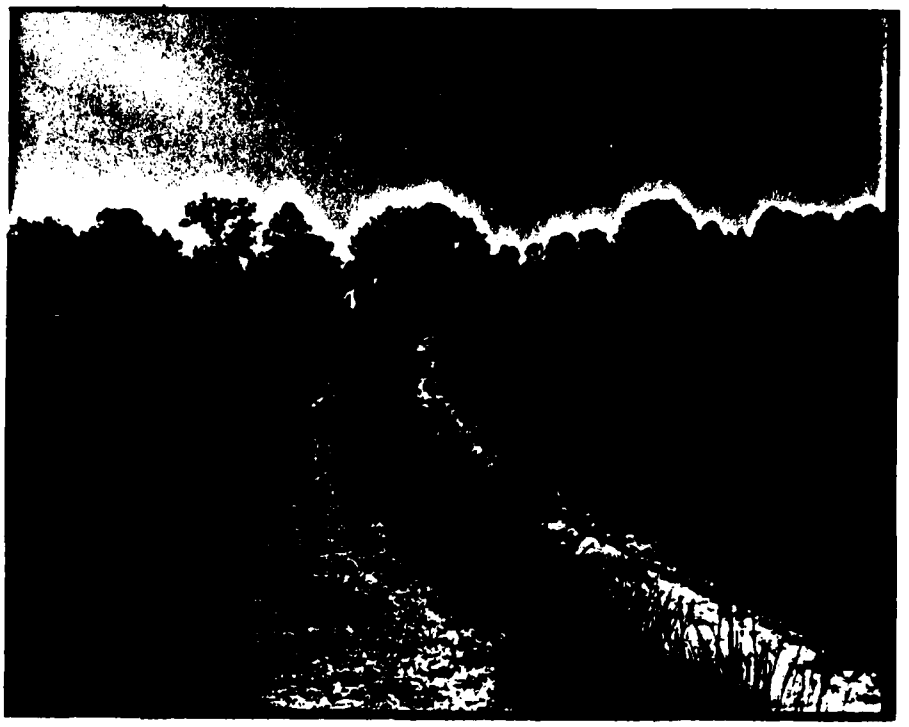


Photo 1: Overview of Lake and Dam

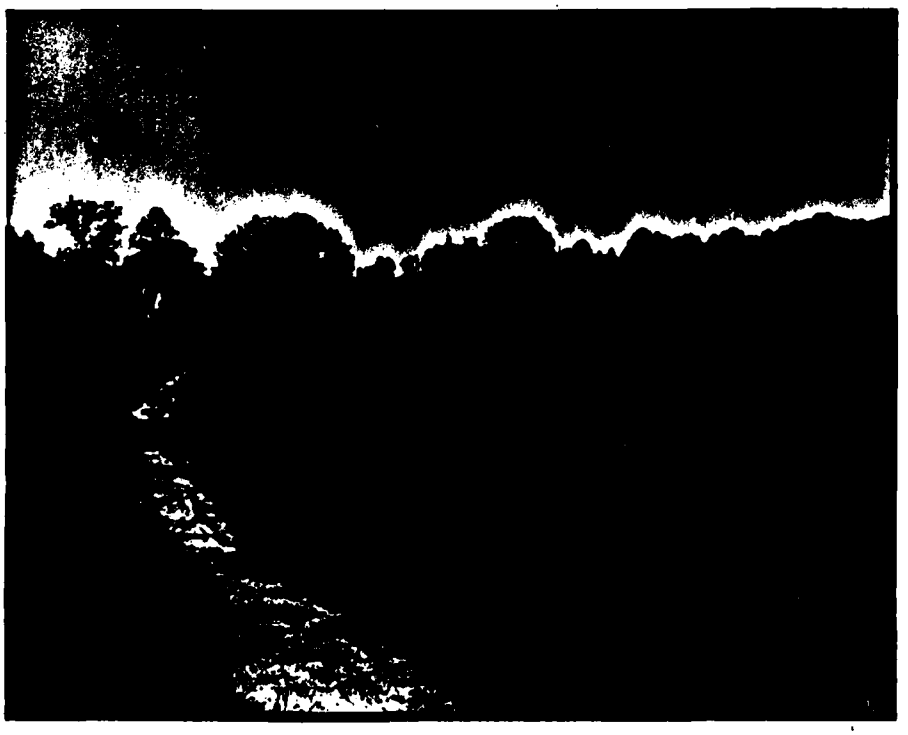


Photo 2: Upstream Slope

Photo 3: Wavewash on Upstream Slope

Photo 4: Downstream Slope from Right Abutment

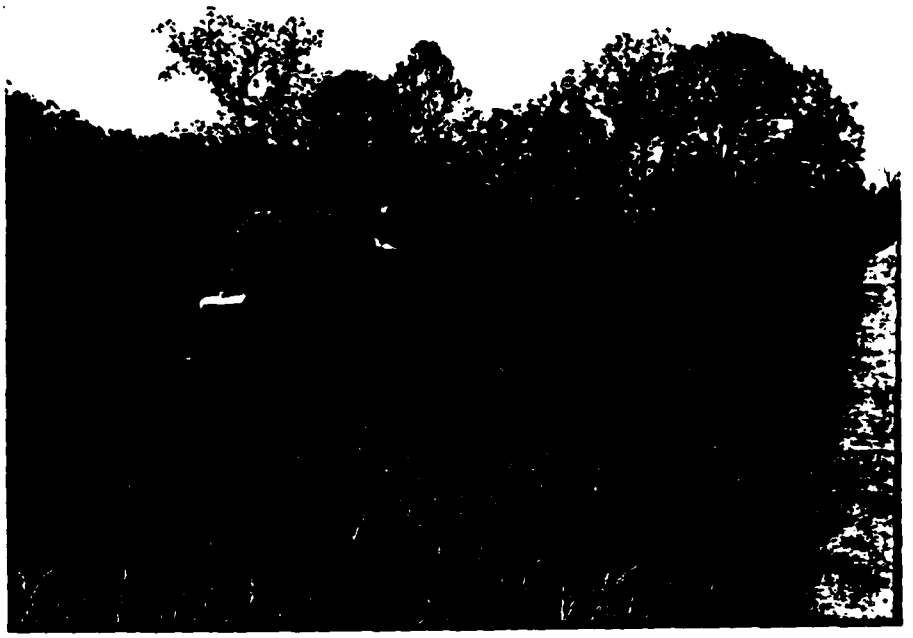


Photo 5: Dwellings at Downstream Toe near Right Abutment

Photo 6: Downstream Slope

Photo 7: Erosion on Downstream Slope

Photo 8: Willow Trees on Upstream Slope

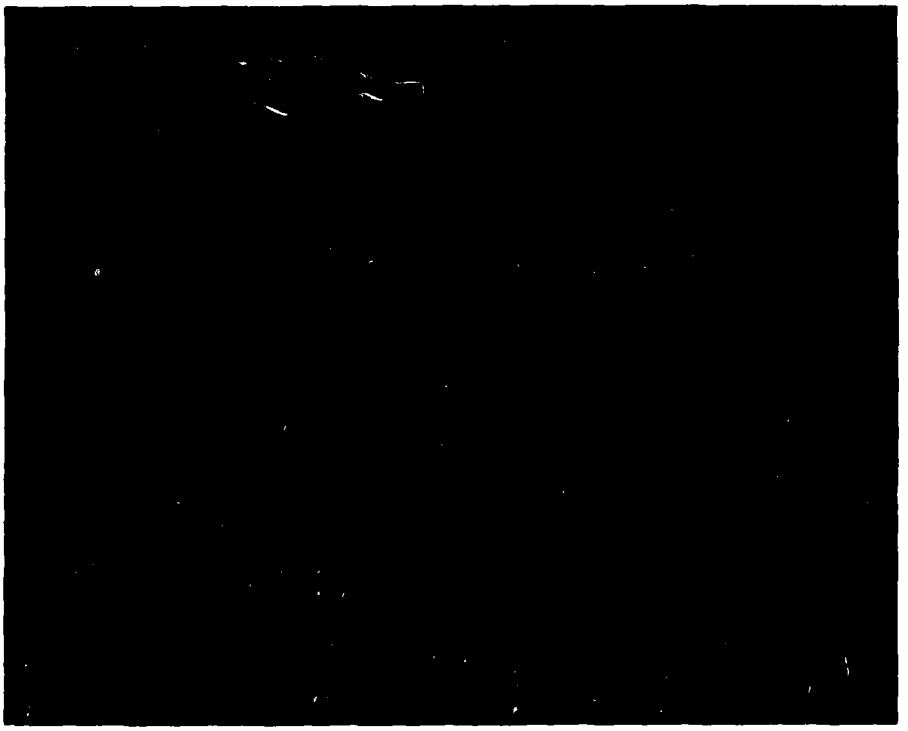


Photo 9: Growth in Seepage Area at Downstream Toe

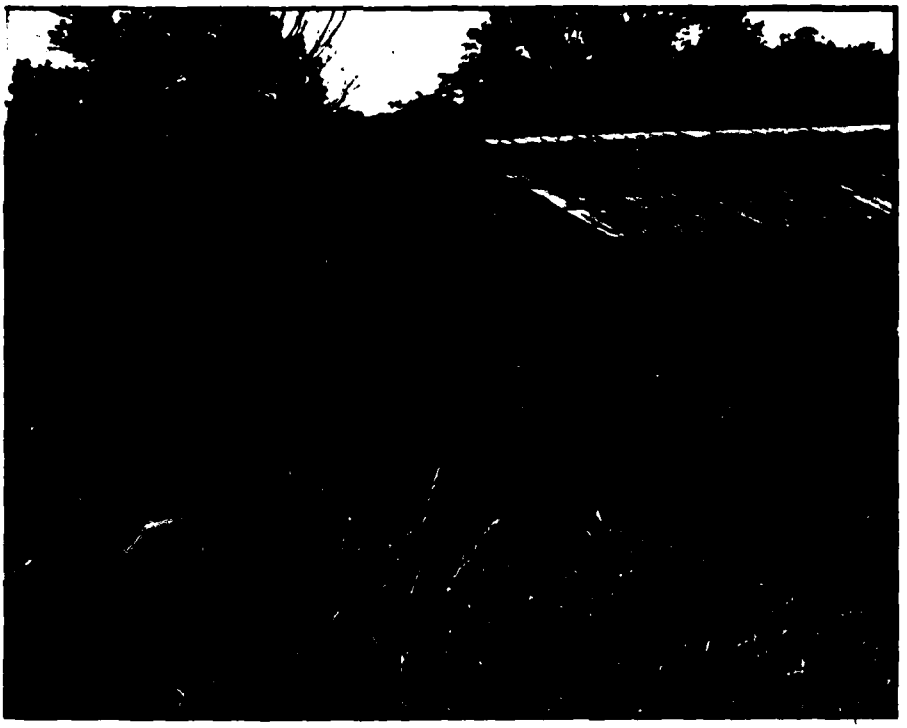


Photo 10: Growth in Seepage Area at Downstream Toe

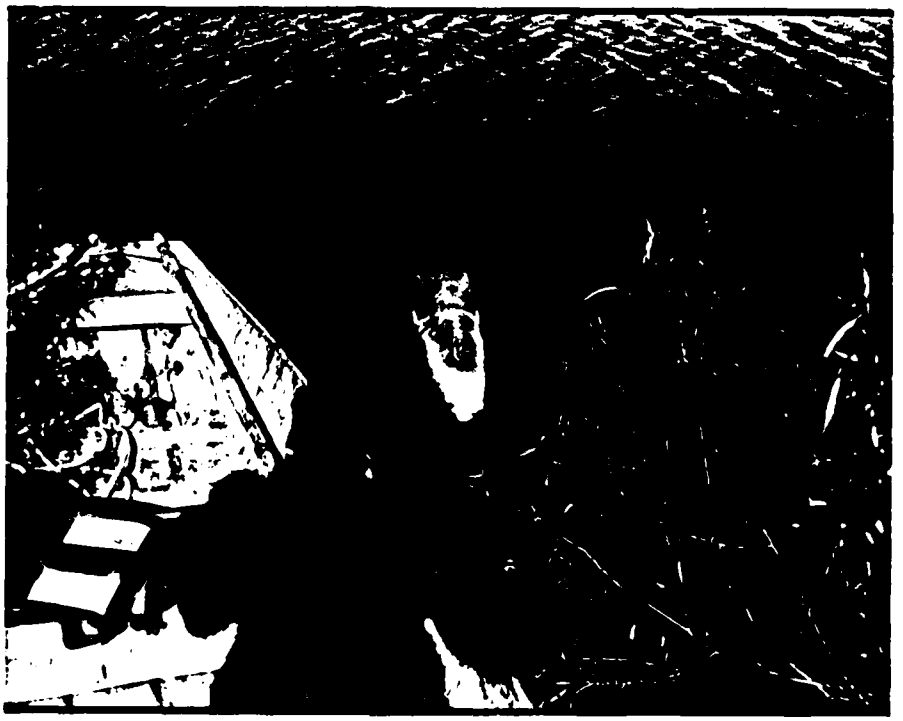


Photo 11: Inlet Structure

Photo 12: Outiet Structure and Stilling Basin

Photo 13: Emergency Spillway

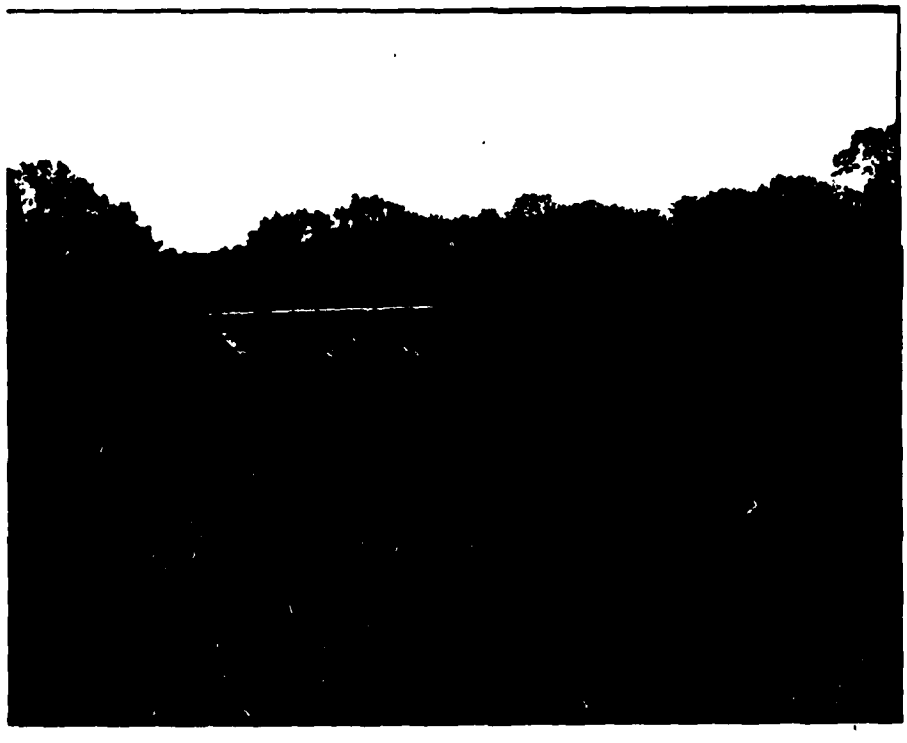


Photo 14: Structures Near Downstream Toe

Photo 15: Storage Bin in Floodplain

Photo 16: Dwelling Downstream of Dam

Photo 17: Dwelling Downstream of Dam

Photo 18: Dwelling Downstream of Dam